

**REMARKS**

Claims 1-3 and 5-16 are pending in this application. By this Amendment, claim 1 is amended and claim 4 is canceled without prejudice to or disclaimer of the subject matter therein. Support for the amendments to claim 1 can be found in the specification as originally filed; and in original claims 1 and 4. No new matter is added by these amendments.

**I. Claim Rejections Under §102**

The Office Action rejects claims 12-14 and 16 under 35 U.S.C. §102(b) over U.S. Patent No. 6,331,236 to Mani (Mani 236) and also rejects claims 12-14 and 16 under 35 U.S.C. §102(b) over U.S. Patent No. 6,221,225 to Mani (Mani 225). Because the disclosures of these references and the rejections over the references are closely related, Applicant respectfully traverses the rejections together.

Independent claim 12 sets forth an "electrodialysis or electrolysis apparatus for separating a fermentation broth into a residual stream comprising multivalent ions and lactate ions, comprising a first compartment which is limited by an anion-selective or non-selective membrane and a cathode, which further comprises means for introducing the fermentation broth, and a second compartment limited by the anion-selective or non-selective membrane and an anode, which further comprises means for removing lactic acid, and optionally means to recycle the residual stream to the fermentation broth." Claims 13, 14, and 16 depend from claim 12 and incorporate all the limitations thereof.

As discussed in the specification, multivalent ions were thought to foul membranes, inhibiting electrodialysis processes, and were commonly removed before electrodialysis. *See, e.g.,* Specification, p. 1, lines 20-24. The Mani references teach removing multivalent ions by chelation and ion exchange or nanofiltration *prior to* electrodialysis to prevent fouling of their electrodialysis processes, which exclusively treat *monovalent* ions. *See, e.g.,* Specification, p.

2, lines 1-14; Mani 236, Abstract, col. 1, lines 16-35, col. 3, lines 23-40, col. 9, line 24-col. 10, line 25; Mani 225, Abstract, col. 7, lines 23-38, col. 8, lines 32-44, col. 12, lines 50-65.

On the contrary, the apparatus of claim 12 separates a fermentation broth into a residual stream comprising *multivalent* ions and lactate ions. By treating fermentation broths that include *multivalent* ions, the claimed apparatus differs from conventional apparatuses, such as those disclosed by the Mani references. That is, Mani 236 and Mani 225 each teaches an apparatus in which multivalent ions are removed *prior to* separation by electrodialysis of monovalent ions and lactate. Thus, neither Mani reference teaches an "electrodialysis or electrolysis apparatus for separating a fermentation broth into a residual stream comprising multivalent ions and lactate ions," at least because neither Mani reference teaches that multivalent ions may be present in the residual stream.

For at least the above reasons, independent claim 12 and its dependent claims 13, 14, and 16 are patentable over each of Mani 236 and Mani 225. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

## **II. Claim Rejections Under §103**

The Office Action rejects claims 1-11 and 15 under 35 U.S.C. §103(a) over Mani 236 and also rejects claims 1-11 and 15 under 35 U.S.C. §103(a) over Mani 225. Because the disclosures of these references and the rejections over the references are closely related, Applicant respectfully traverses the rejections together.

Independent claim 1 sets forth, in pertinent part, a "method of separating multivalent ions and lactate ions from a fermentation broth comprising a multivalent ion lactate salt by using an electrodialysis or electrolysis apparatus, the method comprising: introducing the broth into a first compartment, said broth having a multivalent ion concentration of at least 0.1 mole/l ... ; converting the multivalent ion to obtain a residual stream comprising a

hydroxide of the multivalent ion." Claims 2, 3, 5-11, and 15 depend, directly or indirectly, from claim 1 and incorporate all the limitations thereof.

The Office Action applies the same teachings of Mani 236 and Mani 225 to independent claim 1 and its dependent claims as was applied to claims 12-14 and 16, discussed above. The Office Action admits that neither Mani 236 nor Mani 225 teaches or suggests a method of separating multivalent lactate ions from a fermentation broth that contains at least 0.1 mole/l of multivalent ions and less than 300 g/l of lactate ions. Based on the methods associated with the Mani 236 and Mani 225 apparatuses, the Office Action takes the position that claims 1-11 and 15 would have been obvious over each Mani reference. Applicant respectfully disagrees.

As discussed above, the Mani references teach apparatuses and methods in which multivalent ions are removed *prior to* electrodialysis used to separate monovalent ions and lactate. Neither Mani 236 nor Mani 225 teaches, and neither Mani reference suggests, a method that includes "introducing the broth into a first compartment, said broth having a multivalent ion concentration of at least 0.1 mole/l ... ; converting the multivalent ion to obtain a residual stream comprising a hydroxide of the multivalent ion," as set forth in independent claim 1. Instead, Mani 236 and Mani 225 each only teaches methods in which multivalent ions are removed from fermentation broths, and the multivalent ion concentrations are much lower than that set forth in claim 1, such as 20-150 ppm. *See, e.g.,* Mani 236, col. 17, lines 51-52.

The Mani references nowhere teach or suggest that the disclosed methods could be expected to successfully produce lactic acid from solutions or broths having multivalent ion concentrations higher than those disclosed. The only teaching or suggestion that lactic acid can be produced from fermentation broths having a multivalent ion concentration of at least 0.1 mole/l is found in the instant specification. As is well settled, relying on an Applicant's

specification for motivation to combine cited references constitutes impermissible hindsight. *See, e.g.*, MPEP §2143 ("The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure.") (citing *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991)).

Because neither Mani reference teaches or suggests a method for separating multivalent ions and lactate ions from a fermentation broth in which the broth, including multivalent ions in the claimed concentrations and lactate ions, is introduced to a first compartment of a cell, as required by independent claim 1, claim 1 and its dependent claims would not have been obvious over Mani 236 or Mani 225.

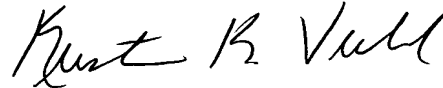
For at least the above reasons, claims 1-3, 5-11, and 15 are patentable over each of Mani 236 and Mani 225. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

### **III. Conclusion**

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-3 and 5-16 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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